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PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) FLUID-CONTROLLED VALVE

(71) I, BRUCE LEWIS LORENZO, a citizen of the United States of America, of 124 Fenner Avenue, Clifton, State of New Jersey, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a fluid-controlled valve, in particular a pneumatic valve employed for the purpose of controlling the flow of fluids.

According to the invention there is provided a valve comprising a body having a duct to allow the passage of fluid through the valve, said duct leading to the exterior of said valve so as to provide entrance and exit locations of the valve, a plunger to control said fluid through said duct, said plunger being provided with sealing means for terminating the flow of fluid through said valve when the plunger is located within said duct, a piston assembled with said plunger, a fluid actuating chamber confining said piston and connected with said valve body, said fluid actuating chamber containing means to allow actuation fluid to enter and leave said chamber for purposes of acting against said piston and positioning said plunger within said valve fluid duct, and means for sealing said fluid actuating chamber from said valve fluid duct to prevent mixing of either medium with the other and comprising a pair of o-rings disposed around the plunger and defining between them a chamber which is drained by a bleed duct, wherein said piston comprises a disc having sealing means pressing against the interior walls of said actuating fluid chamber and plunger, said disc being held in place by two circlips confined in grooves located in the plunger to form an integral assembly between the piston and plunger.

Preferably the means for sealing the actuating fluid chamber from the valve fluid duct comprises three o-rings held by grooves in said valve body, one of said o-rings being situated so as to provide wiping and cleansing action upon the surface of said plunger.

Preferably the said bleed duct is located between an o-ring adjacent to the actuating fluid chamber and two rings adjacent to the valve fluid duct.

The accompanying drawing shows a preferred valve is a cross-sectional view that discloses the relationship and details of all principal parts and components.

In the drawing there is shown a valve body 1 shaped internally so as to include a duct 2 which serves as the flow path for the valve fluid. The term valve fluid will refer to any fluid passing through duct 2. The body 1 as well as any of the structuaral valve parts may be made e.g. of ferrous or non-ferrous metals or alloys or plastics. Although the duct 2 is generally of circular cross-section, it may be elliptical in cross-section as well, or of some other similar shape. At the terminal locations of the duct 2, means in the form of screw threads 3 are provided to mechanically couple tubing or pipe to these locations so as to conduct fluid into and out of the valve. The coupling function may alternatively be accomplished through such means as sweating, brazing, welding, bolting (flanges) and other similar techniques.

The body 1 contains also a duct within which a plunger 4 slides to open and close the valve thereby controlling the flow of the valve fluid. When the plunger is in the position of that shown in Figure 1, the flow of the valve fluid through the duct is inhibited and the valve is closed.

To permit fluid to pass through the valve duct 2, the plunger 4 may be completely retracted so as not to extend into the path of the fluid and thus reduces losses of velocity and pressure within the valve fluid.

The plunger 4 is actuated by means of a fluid chamber 5 which is an integral part of the valve. To retract the plunger and thereby open the valve, the actuating fluid is admitted through the opening 6. This opening connects the exterior of the valve to the actuating fluid chamber through the duct 7. Opening 6 has provision by means of which a hose, pipe or tubing may be coupled to it, in order to connect the actuating fluid chamber to its source (not shown). Such a coupling may

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be conveniently accomplished through the application of a screw thread, but other coupling methods as enumerated as alternatives to the screw threads 3 may also be employed.

When the fluid stream through duct 7 impinges upon a piston in the form of a disc 9, a force is generated along the longitudinal axis of the plunger, and this force serves to retract the plunger. Through proper control of the actuating fluid flow from its source, and with the use of a spring in chamber 5 if necessary, it is possible to retract the plunger only partially and thus reduce at will the amount of fluid flow through the valve.

When the plunger is fully retracted so as not to interfere with the normal flow pattern of the fluid in the valve, disc 9 is in contact with the head structure 10 of the actuating chamber. The head structure is connected to walls 11 which form the sides of the actuating chamber. These walls connect structure 10 with the body 1 and accordingly form an enclosure for the actuating fluid. These walls 11 are pressure resisting and may be made of any of the materials cited for the construction of the the body 1. It is not necessary that the material used for walls 11 and head 10 be identical to the composition of the body 1. The connection of head 10 and wall 11 to the body 1 may be accomplished by bolting, clamping, threading, etc.

Assuming the plunger has been retracted so that disc 9 is in contact with head 10, the plunger can be returned to the position shown in Figure 1, by admitting a fluid stream through opening 12 in the head structure. When the fluid stream is applied to the top surface of disc 9, an axial force is generated that causes the plunger to slide into the position which closes the valve. In a manner similar to that described for opening 6, opening 12 is coupled to the actuating fluid source by means of a hose, piping or tubing. This coupling may be accomplished conveniently through a screw thread or through any of the other methods cited for the case of opening 6. Alternatively, a spring (not shown) may be placed on either side of disc 9 if it is desired to have the fluid actuate the valve in only one direction and to have the spring actuate the valve in the other direction.

For the actuating fluid chamber to be efficient in the operation of the plunger, it is essential that a pressure-tight seal exists between the head 10 and walls 11. This sealing action is accomplished by inserting an o-ring 13 at the interface of these two parts of the valve. This o-ring may be made of a resilient material such as neoprene or some similar material. A similar o-ring 14 is inserted at the interface of wall 11 and structure 1, to form a pressure-tight seal between these two sections.

The force generated as a result of the pressure of the air upon disc 9, is transmitted to the plunger by securing the disc to the plunger through means of a circlip 15. This circlip grips the plunger through the groove 16 which is formed in the plunger shank. Accordingly, circlip 15 supports the side of the disc facing the head, and prevents it from sliding off the plunger. Annular spaces *9a* and *9b* are defined between o-rings which separate the two sides of the disc 9. A circlip 19 is situated in a groove 20 similar to that of groove 16. Thus disc 9 is held by circlips 15 and 19. O-rings 17 and 18 form an air-tight seal between the plunger and disc 9, and between walls 11 and disc 9, respectively. Such a seal is required in order to develop the full effect of the actuating fluid pressure upon the disc for the purpose of moving the plunger. The assembly of discs 9, o-rings 17 and 18, and circlips 15 and 19, thus comprise a piston which is fixed to the plunger.

The actuating fluid in chamber 5 is isolated or sealed off from duct 2 occupied by the valve fluid through the presence of o-rings 21, 22 and 23. Ring 23 is not necessary except for the advantage of dual seals on the valve chamber side of duct 2. Such isolation of the chamber 5 from the duct 2 is required to prevent intermixing of the actuating fluid used to operate the plunger, with the fluid flowing through the valve. The o-rings 21, 22, and 23 are held by grooves located within the body 1.

Aside from its sealing function, o-ring 23 also serves to clean the plunger shank from foreign particles that may have collected on its surface through usage of the valve. This cleansing function results from the wiping action generated when the plunger slides towards its retracted position for the purpose of opening the valve.

After extended usage and aging of the parts of the valve, it is possible that some amount of leakage may occur through the o-rings. Under these circumstances, portions of the fluid in the valve are lost or the fluid enters the actuating chamber in the usual type of valve. This invention, however, avoids this problem resulting from such leakage, by providing a bleed hole 24 between o-rings 21 and 22. Accordingly if the sealing action of o-ring 21 should not be complete, any fluid that succeeded to seep past this o-ring from chamber 5, will be conducted through the bleed hole and out to the exterior of the valve. In this manner, any actuating fluid that has seeped past the o-ring will not flow into the fluid in the valve. If, on the other hand, o-rings 22 and 23 were not completely effective in their sealing function, any seepage of fluid from the valve past these o-rings would also be conducted away by bleed hole 24. In this situation the bleed hole serves to

prevent the valve fluid from flowing into the fluid actuating chamber thereby causing possible problems with the actuating fluid source. Bleed hole 24 is not only important for carrying away fluid losses, but also to relieve pressures that may get past the faulty seals.

Bleed hole 24 at the surface of the valve, may include a screw thread by means of which a tube, pipe or other conducting means may be connected to the bleed hole to convey the fluid through it, to an external source of collection. By employing two o-rings 22 and 23 adjacent to each other in the manner shown in Figure 1, the possibility of leakage from the valve chamber is reduced.

O-rings 24*a* and 25 are provided to assure that no fluid flows through the valve when the plunger is located in the position which designates that the valve be closed. Two such o-rings may be used to insure sealing in the event one seal fails thus offering longer periods between repairs.

WHAT I CLAIM IS:—

1. A valve comprising a body having a duct to allow the passage of fluid through the valve, said duct leading to the exterior of said valve so as to provide entrance and exit locations of the valve, a plunger to control said fluid through said duct, said plunger being provided with sealing means for terminating the flow of fluid through said valve when the plunger is located within said duct, a piston assembled with said plunger, a fluid actuating chamber confining said piston and connected with said valve body, said fluid actuating chamber containing means to allow actuation fluid to enter and leave said chamber for purposes of acting against said piston and positioning said plunger within said valve fluid duct, and means for sealing said fluid actuating chamber from said valve fluid duct to prevent mixing of either medium with the other and comprising a pair of o-rings disposed around the plunger and defining between them a chamber which is drained by a bleed duct, wherein said piston comprises a disc having sealing means pressing against the interior walls of said actuating fluid chamber and plunger, said disc being held in place by two circlips confined in grooves located in the plunger to form an integral assembly between the piston and plunger.

2. A valve as claimed in claim 1 wherein the means for sealing the actuating fluid chamber from the valve fluid duct comprises three o-rings held by grooves in said valve body, one of said o-rings being situated so as to provide wiping and cleansing action upon the surface of said plunger.

3. A valve as claimed in claim 2 wherein the said bleed duct is located between an o-ring adjacent to the actuating fluid chamber and the two rings adjacent to the valve fluid duct.

4. A valve as claimed in any preceding claim wherein the terminal areas of the valve fluid duct are screwthreaded to permit coupling of conducting means to the entrance and exit of said valve.

5. A valve as claimed in any preceding claim wherein said means to allow actuating fluid to enter and leave said chamber comprises screw threaded openings located on opposite sides of the piston.

6. A valve as claimed in any preceding claim wherein the sealing means on the plunger for terminating the flow of fluid comprises two o-rings held by grooves formed in the plunger surface.

7. A valve as claimed in any preceding claim wherein the section of said bleed duct at the exterior surface of the valve is screw threaded.

8. A valve substantially as described herein with reference to the accompanying drawings.

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1216701 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*